C-AD

Radiation Safety Committee

Issued: October 29, 2014

Minutes of RSC Subcommittee of October 27, 2014

Subject: BLIP Penetration Shielding and ERL Shielding Changes

Present: : D. Beavis, D. Raparia, L. Mausner, C. Theisen D. Kayran, E. T. Lessard, C. Taylor, C. Montag, L. Evers, S. Pontieri, M. Fedurin, and D. Phillips

The meeting was called to review the shielding design for penetrations from the BLIP beam transport to the control room and improvements to the shielding for the ERL enclosure.

BLIP Penetrations

The beam transport system is being modified for the installation of the beam raster system. This system will allow for higher beam intensities on the BLIP targets by painting the beam on the target which will create a more uniform exposure. The existing penetrations have been plugged with steel. The plan is to remove the plugs and use the penetrations for cables for magnets and instrumentation.

The design of the shielding[1] that would replace the plugs has six inches of steel and six inches of poly over the 10 inch diameter penetration. The potential dose rate one foot above the shield is expected to be 40 mrem/hr if 100% of the beam was lost near the penetration and the machine was operating at the ASE limit $5.5*10^{18}$ protons per hour. Footnote1notes that the ASE limit is a factor of two higher than the machine can operate and that other active controls and monitoring are expected to keep beam losses substantially lower than the maximum possible beam current and for any substantial duration. The dose in a beam fault is therefore expected to be far lower than 40 mrem.

The shield could have been placed below the floor level but it was decided that to provide for maximum possible use of the penetration area for cables that the shield would be placed above the concrete floor. The poly provides a high density of hydrogen atoms which are effective is reducing the neutron dose. About 80% of the dose above the shield is from neutrons with energies above 20 MeV. This suggests that if the shield is changed that more steel should be added. It was noted that the present calculation uses poly and not borated poly. It borated poly

[1] D. Beavis, "BLIP Penetrations from the BLIP Spur to the Control Room, Oct. 24, 2014; http://www.c-ad.bnl.gov/esfd/RSC/Memos/10_24_14_BLIP.pdf

can be obtained easily and in time for the shield completion than it will help reduce the low energy neutron dose.

The shield design was recommended for approval with the following recommendations:

- **Place a monitor TLD over the shield to monitor the dose. (CK-BLIP-Dec. 1, 2014-925)**
- **The Linac LP will conduct a beam fault study at 0.1% of beam. (CK-BLIP-Dec. 1, 2014-926**
- **The LE will ensure that configuration control of the shield will follow the requirements of OPM 9.1.12. (CK-BLIP-Dec. 1, 2014-927)**

ERL Shielding Improvements

Shielding changes were made to the ERL enclosure to reduce the potential exposure due to beam faults aligned with shield block seams and the chronic dose from the beam dump out the shielding roof. Seven distinct changes to the shielding were made and the potential dose during beam faults was provided in a memorandum[2].

Some steel bars that cover the roof seams are bridged across from adjacent steel bars. This leaves a gap between the roof seam and the steel shielding. This method was chosen in some cases to reduce the labor in preparing the shielding. It is noted that the dose in short events appears to be large. However, it is very unlikely that these vents can last for any fraction of a second at full beam power.

There is no access to the building roof over ERL if ERL is operating. The building roof posting will be reviewed and discussed with RCD to see if it is appropriate.

It was noted that a few of the calculations for ERL will be checked to provide independent analysis.

The only recommendation made was for one or two monitor TLDs be place on the building roof. (CK-ERL-Dec. 1, 2014-927)

CC:

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Attendees
S. Smith
I. Ben-Zvi
P. Bergh

[2] D. Beavis, "ERL Shielding Changes",Oct. 24, 2014; http://www.c-ad.bnl.gov/esfd/RSC/Memos/10_24_14_ERL.pdf